

Notice of Allowability

Application No.

10/608,083

Examiner

Srirama Channavajjala

Applicant(s)

BRUNO ET AL.

Art Unit

2166

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to 4/10/07.
2. ☒ The allowed claim(s) is/are 1-5,8-10,12-14,16-27,30-32,34-36 and 38-61.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413),
Paper No./Mail Date 4/30/2007.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

1. Claims 1-5,8-10,12-14,16-27,30-32,34-36,38-61 are allowed.
2. Claims 1-5,8-9,11-12,16-17,20-21,23-27,30-31,33-34,38-39,42-43,45-46,49-54,57-61 have been amended 4/10/2007.
3. Claims 1,23,45-46,54 have been amended [12/11/2006].
4. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11 December 2006 has been entered, and a non-final office action was mailed on 1/10/2007.
5. Examiner acknowledges applicant's amendment filed on 7/25/2006.

Drawings

6. The Drawings filed on 6/27/2003 are acceptable for examination purpose.

Information Disclosure Statement

7. The information disclosure statement filed on 8/29/2003 is in compliance with the provisions of 37 CFR 1.97, and has been considered and a copy was enclosed with previous Office Action mailed on 1/25/2006.

Art Unit: 2166

Double Patenting

8. In view of applicant's filing "terminal disclaimer" on 7/25/2006, the non statutory double patent rejection as set forth in the previous office action is hereby withdrawn.

Interview:

9. Applicant's Attorney Sung T Kim, , Reg.No. 45,398 is thanked for the telephone interview on 30 April 2007. During that telephone interview Sung T Kim granted authorization to ***amend claims 1,3,5,12-14,16-17,20-21,23-27,30-32,34-36,38-46,51,54-61, and cancell claims 11,33.***

EXAMINER'S AMENDMENT

10. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Applicant's Attorney Sung T Kim, Reg.No. 45,398 on 30 April 2007.

The application has been amended as follows:

Art Unit: 2166

In the Claims:

1. (Currently amended) A computer implemented method for approximating a number of tuples returned by a database query to optimize queries on a computerized database that comprises a set of predicates that each reference a set of database tables, the method comprising the steps of:

a) determining whether a first estimated selectivity value of the query is stored and returning the stored first estimated selectivity value to approximate the number of tuples returned by the query;

b) if a first estimated selectivity value of the query is not stored, expressing the query as an input query-selectivity value;

c) determining if the query is separable based on properties of the input selectivity value;

d) if the query is separable:

separating the input query-selectivity value to form a product of query selectivity factors;

recursively determining a selectivity value for each query selectivity factor;

combining the selectivity values for each query selectivity factor to determine a second estimated selectivity value of the query;

e) if the query is not separable:

atomically decomposing the input query-selectivity value to form a product that comprises a conditional selectivity expression,

wherein the atomically decomposing step is repeated for one or more atomic decompositions of the input selectivity value to produce a plurality of alternative products that comprise corresponding conditional selectivity expressions;

for each of the plurality of alternative products, matching a corresponding conditional selectivity expression with stored statistics to obtain statistics that can estimate a selectivity value of the conditional selectivity expression by:

compiling a set of candidate statistics that can be used to estimate the selectivity value of the conditional selectivity expression;

selecting candidate statistics to estimate the selectivity value of the conditional selectivity expression based on a selection criteria; and

using the statistics to obtain an estimated selectivity value of the conditional selectivity expression; and

combining the estimated selectivity values of the conditional selectivity expressions corresponding to each alternative product to determine a third estimated selectivity value of the query;

f) storing in memory either the second or third estimated selectivity value of the query based on whether the query is separable.

Art Unit: 2166

2. (Previously presented) The method of claim 1 comprising the step of multiplying the second or third estimated selectivity value of the query by a Cartesian product of the tables referenced by the predicates to obtain a cardinality of the query.
3. (Currently amended) The method of claim 1 wherein the step of separating the input query-selectivity value to form a product of query selectivity factors is performed by separating the predicates that reference different sets of database tables to form a product of query selectivity factors that reference different sets of database tables.
4. (Previously presented) The method of claim 1 wherein each product formed in step e) further comprises a query selectivity factor and wherein a selectivity value for each query selectivity factor is recursively determined.
5. (Currently amended) The method of claim 1 wherein steps c) – f)[[e]] are recursively performed until a non-separable query selectivity that can only be decomposed into a single conditional selectivity expression results.
6. Canceled.
7. Canceled.

Art Unit: 2166

8. (Previously presented) The method of claim 1 comprising the step of associating an error with the third estimated selectivity value that is based on an accuracy with which the statistic matched with a conditional selectivity expression can estimate the selectivity of the conditional selectivity expression.

9. (Previously presented) The method of claim 8 comprising the step of combining the error associated with each conditional selectivity expression to obtain an estimated error for the third estimated selectivity value for the query.

10. (Original) The method of claim 1 wherein the stored statistics comprise histograms on results of previously executed query expressions.

11. Canceled.

12. (Currently amended) The method of claim 14 wherein the selection criteria for a candidate statistic is determined by computing a number of independence assumptions that are made when the candidate is used to estimate the selectivity value of the conditional selectivity expression and the selection criteria is to select the candidate that results in the least number of independence assumptions.

13. (Currently amended) The method of claim 14 wherein the selection criteria for a candidate statistic is determined by comparing the candidate statistic with a

Art Unit: 2166

base statistic over the same column as the candidate statistic and assigning a difference value to the candidate statistic based on a level of difference between the candidate statistic and the base statistic.

14. (Currently amended) The method of claim 14 wherein the step of compiling a set of candidate statistics is performed by including statistics that are on results of queries having the same tables referenced by the conditional selectivity expression or a subset of the tables referenced by the conditional selectivity expression and the same predicates over the tables referenced in the conditional selectivity expression or a subset of the predicates over the tables referenced in the conditional selectivity expressions.

15. Canceled.

16. (Currently amended) The method of claim 1 wherein the step of atomically decomposing the input query-selectivity value is done by exhausting every alternative way of atomically decomposing the query.

17. (Currently amended) The method of claim 1 wherein the steps of atomically decomposing the input query-selectivity value to form a products that comprises a conditional selectivity expressions is performed based on an optimizer search strategy.

Art Unit: 2166

18. (Original) The method of claim 1 wherein the query is disjunctive and comprising the step of transforming the disjunctive predicates into conjunctive predicates by performing a De Morgan transformation on the disjunctive query.

19. (Original) The method of claim 1 wherein the query comprises a GROUP BY predicate over a grouping column and wherein the query is transformed prior to performance of the method steps to return a number of distinct values in the grouping column.

20. (Currently amended) The method of claim 19 wherein the step of atomically decomposing the input query-selectivity value is performed by considering decompositions that are induced by coalescing grouping.

21. (Currently amended) The method of claim 19 wherein the step of atomically decomposing the input query-selectivity value is performed by considering decompositions that are induced by invariant grouping.

22. (Original) The method of claim 1 wherein the stored statistics comprise histograms built over computed columns in a query result.

23. (Currently amended) For use with a database system, a computer readable storage medium having computer executable instructions stored thereon for performing method steps to approximate a number of tuples returned

Art Unit: 2166

by a database query to optimize queries on the database system that comprises a set of predicates that each reference a set of database tables, the method comprising the steps of:

a) determining whether a first estimated selectivity value of the query is stored and returning the stored first estimated selectivity value to approximate the number of tuples returned by the query;

b) if a first estimated selectivity value of the query is not stored, expressing the query as an input query-selectivity value;

c) determining if the query is separable based on properties of the input selectivity value;

d) if the query is separable:

separating the input query-selectivity value to form a product of query selectivity factors;

recursively determining a selectivity value for each query selectivity factor;

combining the selectivity values for each query selectivity factor to determine a second estimated selectivity value of the query;

e) if the query is not separable:

atomically decomposing the input query-selectivity value to form a product that comprises a conditional selectivity expression, wherein the atomically decomposing step is repeated for one or more atomic decompositions of the input selectivity value to

Art Unit: 2166

produce a plurality of alternative products that comprise corresponding conditional selectivity expressions;

for each of the plurality of alternative products, matching a corresponding conditional selectivity expression with stored statistics to obtain statistics that can estimate a selectivity value of the conditional selectivity expression by:

compiling a set of candidate statistics that can be used to estimate the selectivity value of the conditional selectivity expression;

selecting candidate statistics to estimate the selectivity value of the conditional selectivity expression based on a selection criteria; and

using the statistics to obtain an estimated selectivity value of the conditional selectivity expression; and

combining the estimated selectivity values of the conditional selectivity expressions corresponding to each alternative product to determine a third estimated selectivity value of the query; and

f) storing in memory either the second or third estimated selectivity value of the query based on whether the query is separable.

Art Unit: 2166

24. (Currently amended) The computer readable storage medium of claim 23 comprising the step of multiplying the second or third estimated selectivity value of the query by a Cartesian product of the tables referenced by the predicates to obtain a cardinality of the query.

25. (Currently amended) The computer readable storage medium of claim 23 wherein the step of separating input query-selectivity value to form a product of query selectivity factors is performed by separating the predicates that reference different sets of database tables to form a product of query selectivity factors that reference different sets of database tables.

26. (Currently amended) The computer readable storage medium of claim 23 wherein each product formed in step e) further comprises a query selectivity factor and wherein a selectivity value for each query selectivity factor is recursively determined.

27. (Currently amended) The computer readable storage medium of claim 23 wherein steps c) – f) are recursively performed until a non-separable query selectivity that can only be decomposed into a single conditional selectivity expression results.

28. Canceled.

Art Unit: 2166

29. Canceled.

30. (Currently amended) The computer readable storage medium of claim 23 comprising the step of associating an error with the third estimated selectivity value that is based on an accuracy with which the statistic matched with a conditional selectivity expression can estimate the selectivity of the conditional selectivity expression.

31. (Currently amended) The computer readable storage medium of claim 30 comprising the step of combining the error associated with each conditional selectivity expression to obtain an estimated error for the third estimated selectivity value for the query.

32. (Currently amended) The computer readable storage medium of claim 23 wherein the stored statistics comprise histograms on results of previously executed query expressions.

33. Canceled.

34. (Currently amended) The computer readable storage medium of claim ~~33~~23 wherein the selection criteria for a candidate statistic is determined by computing a number of independence assumptions that are made when the candidate is used to estimate the selectivity value of the conditional selectivity

Art Unit: 2166

expression and the selection criteria is to select the candidate that results in the least number of independence assumptions.

35. (Currently amended) The computer readable storage medium of claim ~~33~~23 wherein the selection criteria for a candidate statistic is determined by comparing the candidate statistic with a base statistic over the same column as the candidate statistic and assigning a difference value to the candidate statistic based on a level of difference between the candidate statistic and the base statistic.

36. (Currently amended) The computer readable storage medium of claim ~~33~~23 wherein the step of compiling a set of candidate statistics is performed by including statistics that are on results of queries having the same tables referenced by the conditional selectivity expression or a subset of the tables referenced by the conditional selectivity expression and the same predicates over the tables referenced in the conditional selectivity expression or a subset of the predicates over the tables referenced in the conditional selectivity expressions.

37. Canceled.

Art Unit: 2166

38. (Currently amended) The computer readable storage medium of claim 23 wherein the step of atomically decomposing the input query-selectivity value is done by exhausting every alternative way of atomically decomposing the query.

39. (Currently amended) The computer readable storage medium of claim 23 wherein the steps of atomically decomposing the input query-selectivity value to form a product that comprises a conditional selectivity expressions is performed based on an optimizer search strategy.

40. (Currently amended) The computer readable storage medium of claim 23 wherein the query is disjunctive and comprising the step of transforming the disjunctive predicates into conjunctive predicates by performing a De Morgan transformation on the disjunctive query.

41. (Currently amended) The computer readable storage medium of claim 23 wherein the query comprises a GROUP BY predicate over a grouping column and wherein the query is transformed prior to performance of the method steps to return a number of distinct values in the grouping column.

42. (Currently amended) The computer readable storage medium of claim 41 wherein the step of atomically decomposing the input query-selectivity value is performed by considering decompositions that are induced by coalescing grouping.

43. (Currently amended) The computer readable storage medium method of claim 41 wherein the step of atomically decomposing the input query-selectivity value is performed by considering decompositions that are induced by invariant grouping.

44. (Currently amended) The computer readable storage medium of claim 23 wherein the stored statistics comprise histograms built over computed columns in a query result.

45. (Currently amended) A computer system comprising one or more processors and memory for approximating a number of tuples returned by a database query to optimize queries on a computerized database that comprises a set of predicates that each reference a set of database tables comprising:

a) means for determining whether a first estimated selectivity value of the query is stored and means for returning the stored first estimated selectivity value to approximate the number of tuples returned by the query;

b) means for expressing the query as an input query-selectivity value if a first estimated selectivity value of the query is not stored;

c) means for determining if the query is separable based on properties of the input selectivity value;

d) means for separating the input query-selectivity value to form a product of query selectivity factors if the query is separable, further comprising:

Art Unit: 2166

means for recursively determining a selectivity value for each query selectivity factor;

means for combining the selectivity values for each query selectivity factor to determine a second estimated selectivity value of the query;

e) means for atomically decomposing the input query-selectivity value to form a product that comprises a conditional selectivity expression if the query is not separable, wherein the atomically decomposing is repeated for one or more atomic decompositions of the input selectivity value to produce a plurality of alternative products that comprise corresponding conditional selectivity expressions, further comprising;

means for matching a corresponding conditional selectivity expression for each of the plurality of alternative products with stored statistics to obtain statistics that can estimate a selectivity value of the conditional selectivity expression, comprising:

means for compiling a set of candidate statistics that can be used to estimate the selectivity value of the conditional selectivity expression;

means for selecting candidate statistics to estimate the selectivity value of the conditional selectivity expression based on a selection criteria; and

means for using the statistics to obtain an estimated selectivity value of the conditional selectivity expression; and

means for combining the estimated selectivity values of the conditional selectivity expressions corresponding to each alternative product to determine a third estimated selectivity value of the query; and

f) means for storing in memory either the second or third estimated selectivity value of the query based on whether the query is separable.

46. (Currently amended) A computer implemented method for approximating a number of tuples returned by a database query to optimize queries on a computerized database that comprises a set of predicates that each reference a set of database tables, the method comprising the steps of:

- a) expressing the query as an input query-selectivity value;
- b) determining if the query is separable based on properties of the input selectivity value;
- c) if the query is separable:
 - separating the input query-selectivity value by separating the predicates that reference different sets of database tables to form a product of query selectivity factors that reference different sets of database tables;
 - recursively determining a selectivity value for each query selectivity factor;
 - combining the selectivity values for each query selectivity factor to determine a first estimated selectivity value of the query;

d) if the query is not separable:

atomically decomposing the input query-selectivity value to form a product that comprises a conditional selectivity expression, wherein the atomically decomposing step is repeated for one or more atomic decompositions of the input selectivity value to produce a plurality of alternative products that comprise corresponding conditional selectivity expressions;

for each of the plurality of alternative products, matching a corresponding conditional selectivity expression with stored statistics to obtain statistics that can estimate a selectivity value of the conditional selectivity expression by:

compiling a set of candidate statistics that can be used to estimate the selectivity value of the conditional selectivity expression;

selecting candidate statistics to estimate the selectivity value of the conditional selectivity expression based on a selection criteria; and

using the statistics to obtain an estimated selectivity value of the conditional selectivity expression; and

combining the estimated selectivity values of the conditional selectivity expressions corresponding to each alternative product to determine a second estimated selectivity value of the query; and

e) storing in memory either the first or second estimated selectivity value of the query based on whether the query is separable.

47. (Original) The method of claim 46 wherein the selection criteria for a candidate statistic is determined by computing a number of independence assumptions that are made when the candidate is used to estimate the selectivity of the conditional selectivity expression and the selection criteria is to select the candidate that results in the least number of independence assumptions.

48. (Original) The method of claim 46 wherein the selection criteria for a candidate statistic is determined by comparing the candidate statistic with a base statistic over the same column as the candidate statistic and assigning a difference value to the candidate statistic based on a level of difference between the candidate statistic and the base statistic.

49. (Previously presented) The method of claim 46 wherein the step of compiling a set of candidate statistics is performed by including statistics that are on results of queries having the same tables referenced by the conditional selectivity expression or a subset of the tables referenced by the conditional selectivity expression and the same predicates over the tables referenced in the conditional selectivity expression or a subset of the predicates over the tables referenced in the conditional selectivity expression.

Art Unit: 2166

50. (Previously presented) The method of claim 46 wherein each product formed in step d) further comprises a query selectivity factor and wherein a selectivity value for each query selectivity factor is recursively determined.

51. (Currently amended) The method of claim 46 wherein steps b) – e[[d]]) are recursively performed until a non-separable query selectivity that can only be decomposed into a single conditional selectivity expression results.

52. (Previously presented) The method of claim 46 comprising the step of associating an error with the second estimated selectivity value that is based on an accuracy with which the statistic matched with a conditional selectivity expression can estimate the selectivity of the conditional selectivity expression.

53. (Previously presented) The method of claim 52 comprising the step of combining the error associated with each conditional selectivity expression to obtain an estimated error for the second estimated selectivity value for the query.

54. (Currently amended) For use with a database system, a computer readable storage medium having computer executable instructions stored thereon for performing method steps to approximate a number of tuples returned by a database query to optimize queries on the database system that comprises a set of predicates that each reference a set of database tables, the method comprising the steps of:

Art Unit: 2166

- a) expressing the query as an input query-selectivity value;
- b) determining if the query is separable based on properties of the input selectivity value;

- c) if the query is separable:

separating the input query-selectivity value by separating the predicates that reference different sets of database tables to form a product of query selectivity factors that reference different sets of database tables;

recursively determining a selectivity value for each query selectivity factor;

combining the selectivity values for each query selectivity factor to determine a first estimated selectivity value of the query;

- d) if the query is not separable:

atomically decomposing the input query-selectivity value to form a product that comprises a conditional selectivity expression, wherein the atomically decomposing step is repeated for one or more atomic decompositions of the input selectivity value to produce a plurality of alternative products that comprise corresponding conditional selectivity expressions;

for each of the plurality of alternative products, matching a corresponding conditional selectivity expression with stored statistics to obtain statistics that can estimate a selectivity value of the conditional selectivity expression by:

compiling a set of candidate statistics that can be used to estimate the selectivity value of the conditional selectivity expression;

selecting candidate statistics to estimate the selectivity value of the conditional selectivity expression based on a selection criteria; and

using the statistics to obtain an estimated selectivity value of the conditional selectivity expression; and

combining the estimated selectivity values of the conditional selectivity expressions corresponding to each alternative product to determine a second estimated selectivity value of the query; and

e) storing in memory either the first or second estimated selectivity value of the query based on whether the query is separable.

55. (Currently amended) The computer readable storage medium of claim 54 wherein the selection criteria for a candidate statistic is determined by computing a number of independence assumptions that are made when the candidate is used to estimate the selectivity of the conditional selectivity expression and the selection criteria is to select the candidate that results in the least number of independence assumptions.

56. (Currently amended) The computer readable storage medium of claim 54 wherein the selection criteria for a candidate statistic is determined by comparing

Art Unit: 2166

the candidate statistic with a base statistic over the same column as the candidate statistic and assigning a difference value to the candidate statistic based on a level of difference between the candidate statistic and the base statistic.

57. (Currently amended) The computer readable storage medium of claim 54 wherein the step of compiling a set of candidate statistics is performed by including statistics that are on results of queries having the same tables referenced by the conditional selectivity expression or a subset of the tables referenced by the conditional selectivity expression and the same predicates over the tables referenced in the conditional selectivity expression or a subset of the predicates over the tables referenced in the conditional selectivity expression.

58. (Currently amended) The computer readable storage medium of claim 54 wherein each product formed in step d) further comprises a query selectivity factor and wherein a selectivity value for each query selectivity factor is recursively determined.

59. (Currently amended) The computer readable storage medium of claim 54 wherein steps b) – e) are recursively performed until a non-separable query selectivity that can only be decomposed into a single conditional selectivity expression results.

Art Unit: 2166

60. (Currently amended) The computer readable storage medium of claim 54 comprising the step of associating an error with the second estimated selectivity value that is based on an accuracy with which the statistic matched with a conditional selectivity expression can estimate the selectivity of the conditional selectivity expression.

61. (Currently amended) The computer readable storage medium of claim 60 comprising the step of combining the error associated with each conditional selectivity expression to obtain an estimated error for the second estimated selectivity value for the query.

Pursuant to MPEP 606.01 the Title is changed to read

***--METHOD AND APPARATUS FOR SELECTING CANDIDATE
STATISTICS TO ESTIMATE THE SELECTIVITY VALUE OF THE
CONDITIONAL SELECTIVITY EXPRESSION IN OPTIMIZE QUERIES BASED
ON A SET OF PREDICATES THAT EACH REFERENCE A SET OF
RELATIONAL DATABASE TABLES —***

Reasons for allowance

Claims 1-5,8-10,12-14,16-27,30-32,34-36,38-61 are allowed

The present invention is directed to optimizing queries on relational databases, more specifically, using conditional selectivity expression for manipulating query plans. A number of tuples returned by a database query having a set of predicates that each reference a set of database tables can be approximated. The query is decomposed to form a product of partial conditional selectivity expressions. The partial conditional selectivity expressions are then matched with stored statistics on query expressions to obtain estimated partial conditional selectivity value. The selectivity of the query is then estimated by combining the obtained conditional selectivity results.

The closest prior art Chaudhuri et al. US Patent No. 5806061 is directed to cost-based optimization over multimedia repositories, more specifically, cost based optimization including translating a user defined ranking expression into a new filter condition, further defining attribute subconditions in the new filter condition, statistics are also compiled in a database which determine the costs to process various searches and probes over the attributes. The grade can be estimated over all attributes specified using a set of statistics stored about the indices. Depending upon how the condition to be used to rank the objects has been built, the filter condition is processed as a conjunctive expression (AND) or a disjunctive expression (OR) to retrieve a sufficient number of objects and thereby minimizing the cost of the search [see Abstract, col 3, line 28-45, fig 2].

The closest prior art Lohman et al. US Patent No. 6763359 is directed to learning from empirical results in query optimization, more specifically, optimizing queries in a relational database management system by generating a plurality of query execution plans for the query, providing an execution model of each of the query execution plans, choosing one of the query execution plans for execution based on the model associated therewith, and exploiting an empirical measurement from the execution of the chosen query execution plan to validate the model associated therewith, by determining whether the model is in error, and by computing one or more adjustments to the model to correct the determined error [see Abstract, col 3, line 20-34].

It is however, noted that the prior art of record either alone or in combination fails to anticipate or render obvious, the recited feature "for each of the plurality of alternative products, matching a corresponding conditional selectivity expression with stored statistics to obtain statistics that can estimate a selectivity value of the conditional selectivity expression by: *compiling a set of candidate statistics that can be used to estimate the selectivity value of the conditional selectivity expression; selecting candidate statistics to estimate the selectivity value of the conditional selectivity expression based on a selection criteria;*" in claim 1,23, 45-46,54

Art Unit: 2166

These features, together with the other limitations of the independent claims are novel and non-obvious over the prior art of record. The dependent claims 2-5,8-10,12-14,16-22,24-27,30-36,38-44,47-53,55-61 being definite, enabled by the specification, and further limiting to the independent claims is also allowable.

The newly cited reference issued to Gao et al. US Pub.No. 2005/0071331 is directed to estimating the compilation time of a query optimizer, more specifically, estimating optimization complexity by estimating the number of distinct join plans that will be generated, rather than the number of join sequences. The join enumerator in an optimizer is reused to iterate all the join pairs, but plan generation is bypassed. A small number of differentiating properties are accumulated during enumeration to calculate the number of generated plans for each enumerated sequences, further estimator provides more accurate compilation time estimation [see Abstract, page 3, col 2, 0028].

Art Unit: 2166

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Srirama Channavajjala whose telephone number is 571-272-4108. The examiner can normally be reached on Monday-Friday from 8:00 AM to 5:30 PM Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alam, Hosain, T, can be reached on (571) 272-3978. The fax phone numbers for the organization where the application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free)

SC

Patent Examiner.

May 4, 2007.

SRIRAMA CHANNAVAJALA
PRIMARY EXAMINER